

Lactase Enzyme Lab

Objective: To examine the effect of lactase on lactose and sucrose, and infer how denaturing lactose affects the enzyme reaction.

Materials:

5 test tubes	Table sugar
5 graduated cylinders	Milk
5 250ml beakers	Lactase tablets (Lactaid®)
Test tube racks	Glucose test strips
1 400 ml beaker	Hot plate

Procedure:

1. Create an enzyme solution by pouring 200 ml of water into a clean beaker. Add one lactase tablet to the water and stir until the tablet has dissolved. Label the beaker.
2. Pour 15 ml of milk into a clean beaker. Like all dairy products milk contains the sugar lactose. Label the beaker.
3. Create a sucrose solution by pouring 100 ml of water into a clean beaker. Add 1 tablespoon of sugar. Stir until the mixture is dissolved. Label the beaker.
4. Denatured enzyme solution:
 - a. Pour 20 ml of the enzyme solution into a test tube.
 - b. Pour 200 ml of water into the 400 ml beaker to create a water bath.
 - c. Place the test tube in the water bath.
 - d. Boil the water in the beaker for up to 30 min. Test to see if the lactase solution is denatured by pouring a small amount into a clean test tube and adding 1 or 2 drops of milk. Test with glucose test paper. Keep boiling if test is positive.
5. Label the test tubes as follows:
 - A: Milk and enzyme solution
 - B: Milk and water
 - C: Milk and denatured enzyme solution
 - D: Sucrose solution and enzyme solution
 - E: Sucrose solution and water
6. In test tube A combine 2 ml of milk and 1 ml of enzyme solution. Wait for two minutes and test for glucose with the glucose test paper. Record the results in the data table, (+ for positive, - for negative).
7. In test tube B, combine 2 ml of milk and 1 ml of water. After two minutes, test for glucose and record the results.
8. In test tube C, combine 2 ml of milk and 1 ml of denatured enzyme solution. After two minutes, test for glucose and record your results.

9. In test tube D, combine 2 ml of sucrose solution and 1 ml of enzyme solution. After two minutes, test for glucose and record the results.
10. In test tube E, combine 2 ml of sucrose solution and 1 ml of water. After 2 minutes, test for glucose and record the results.

Conclusion Questions:

1. Diagram and describe the lactose/lactase reaction.
2. Explain why the enzyme reacted with lactose and not sucrose?
3. What happened when the enzyme was boiled?
4. pH changes can also denature an enzyme. Lactase functions in the small intestine where pH is approximately 9. In what pH range might this enzyme not function? Explain.
5. Is the reaction between lactose and lactase a dehydration or hydrolysis reaction? Explain.